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8 September 1982

## USSR REPORT

## ENERGY

No. 112

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## FUELS

### STATUS OF COAL INDUSTRY DESCRIBED

Leningrad LENINGRADSKAYA PRAVDA in Russian 23 May 82 p 1

[Article by M. Adzhiyev, candidate of economics: "Coal Energy"]

[Text] One-third of all the capital investments in our country are spent on the development of the fuel and energy complex which includes not only energy extracting, but also energy consuming sectors. About 15 percent of the workers are engaged in them.

During the 1950's-1960's, the percentage of coal in the country's fuel balance noticeably diminished because of the highly effective types of fuel, oil and gas. Now the situation is changing. This is especially apparent in the example of thermal power engineering, the country's main consumer of fuel. In the previous 20-year period, we mainly built thermal power plants that use mazut and gas. But already in the current five-year plan and in the subsequent, power plants will be predominantly built which consume coal and nuclear fuel.

Solid fuel is used in large amounts in the European sector of the Soviet Union, however the reserves of the coal fields here are comparatively low, they only comprise a tenth of the national. This is why the coal basins of Siberia and the Far East are now under accelerated development: Kuznetsk, Karaganda, Ekibastuz and others. The last two alone yield over a hundred million tons of fuel per year.

The fields of the eastern regions are promising. Here over 80 percent of all the coal reserves of the country are located. The Lenskiy, Taymir and Tunguskiy giant basins will probably only begin to be used in the 21st century. The Kansk-Achinsk and South Yakutsk basins have already begun to be developed. This is especially gratifying for here a lot is being done to positively resolve the problems of wastes.

The Institute of Fuel Minerals has developed and already verified on an industrial scale the technology for producing agloporite, high-quality construction material. The batch of ceramics obtained from the wastes has received a high estimate by the builders. The best agloporite is being produced from stripped rocks in the open pits of "Berezovskiy" and "Itatskiy" at the Kansk-Achinsk coal field.

The specialists have proven the expediency of creating coal-construction combines where materials for industrial and civil construction can be produced from coal wastes. This is a profitable business and the first shops are already being built. For example, in Kuzbass at the enrichment plants "Abadashevskaya" and "Berezovskaya" shops are being built for recovery of wastes and production of brick.

The new production promises to be very important for reprocessing wastes of the Ekibastuz basin. The original technology makes it possible without large capital investments to obtain aluminum, silicon and other products in addition to coal.

Scientific and technical progress has afforded the opportunity of obtaining from coal many other useful products. Thus, for example, technology has been worked out for producing phenols and benzenes, naphthalin, hydrogen and ethylene from the light fraction of the coal resin. From a mixture of gases one can produce methyl alcohol, formic acid which is needed in medicine, in the textile and food industry. Moreover, as indicated by studies, excellent preparations are produced from coal which stimulate the growth of agricultural plants.

The main percentage of coal extraction in the Soviet Union at present is at the mines as before. Here because of the technical re-equipping in the core, the nature of the miner's work has changed and its efficiency has risen. The number of giant mines is rising in the country.

A qualitatively new trend in the development of equipment and technology for coal extraction is the creation of a frontal unit for coal extraction under especially severe conditions, with so-called declining beds. This unit is already operating at the "Zenkovskaya" mine in the Kuzbass.

There is yet another innovation, the unique combine "Poisk-2." It successfully extracts coal from the thin steep beds and is irreplaceable in drilling explosive zones.

Mechanized complexes are operating in all the coal basins of the USSR.

The introduction of automated complexes with remote control, as well as other modern equipment will permit coal extraction without the constant presence of people in the stopping faces.

There are good prospects for the hydraulic method of coal extraction.

Scientific-technical progress seemed to induce a second birth of the coal industry in our country. Now the sector occupies a leading place in the world in scales of use and volumes of coal extraction from comprehensively mechanized faces. All of this will bring coal extraction in the country to 775 million T by 1985.

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## FUELS

### KUZBASS, KARAGANDA COAL PRODUCTION LAGGING DISCUSSED

Moscow SOTSIALISTICHESKAYA INDUSTRIYA in Russian 16 May 82 p 2

[Article: "The Mines Will Operate Better"]

[Text] In February of this year, our newspaper published materials on the operation of the coal industry in the Kuzbass and Karaganda, as well as the use of methane extracted during the working of the gas beds. The technical director of the production association "Yuzhkuzbassugol" Yu. Malyshev in his article "A Ton Begins from a Meter" (11 February) shared the opinion of why fuel extraction is not rising in the basin despite the increased technical equipping of the mines. In his opinion, this occurs because a gap has formed in the coal industry between the potentialities of the extracting and drilling operations. The author has suggested a number of organizational and technical measures to improve efficiency of the work of the drillers. He related an interesting experiment which is being carried out for these purposes in the Kuzbass and he critically evaluated the present-day drilling equipment.

Deputy Minister of the Coal Industry of the USSR Ye. Rozhchenko told the editorial staff that the ministry considers the criticism correct. The all-union industrial association "Soyuzglemash" is taking measures to increase the output of drilling equipment for the mines of Kuzbass. Soon after publication of the article, the USSR Ministry of the Coal Industry together with the Kemerov CPSU obkom held an all-union school in Mezhdurechensk on leading methods of labor of drillers where the experience of organizing drilling of mine shafts in the association "Yuzhkuzbassugol" was studied. The author of the article in SOTSIALISTICHESKAYA INDUSTRIYA, Yu. Malyshev gave a report. After exchange of opinions, recommendations were made for broad introduction of the experience of the best brigades of drillers on the sector mines. The deputy minister stresses that as a result of measures taken, the volume of mine drilling operations has increased. In any case, this year the drillers of the Kuzbass are overfulfilling their plan.

The article of our in-house correspondent B. Glotova "Why the Karaganda Mines Are Lagging" (18 February) drew the conclusion that this also occurs mainly because of lagging in the basin of drilling operations, and because the leaders of the contracting mine-building organizations have neglected preparation of new levels for the coal enterprises. The first secretary of the Karaganda Kazakhstan Communist Party Obkom A. Korkin in his response to the

editorial staff writes that facts regarding shortcomings in the work of many mines, and the "Karagandaugol'" association as a whole for fuel extraction by the underground method presented in the article actually did occur. The article was examined in the party obkom, at the council of mine directors, in the association and in the collectives of the coal enterprises. The production association "Karagandaugol'" has outlined specific measures to improve work of the lagging mines, having stipulated the acceleration of work in capital construction to introduce new levels, improve the use of the available and introduce new equipment, create safe working conditions for the miners. The office of the party obkom has approved organizational-technical measures of the association "Karagandaugol'" for drastic increase in the volumes and rates of making preparatory shafts in 1982. This, Comrade Korkin believes, will permit an increase this year in the tunneling as compared to last year by more than 40 kilometers. "The party obkom and the association 'Karagandaugol'", writes Comrade Korkin, "are taking all the necessary measures for unconditional fulfillment of the plan for coal extraction by the underground method in 1982." The author of the response to the editorial staff also explains why it was decided to force the work at the Borlinskiy coal field in the shortest periods: its development will drastically reduce the use of coking coals for communal-general and energy needs.

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## FUELS

### POOR EQUIPMENT REDUCES VORKUTA MINE OUTPUT

Moscow SOVETSKAYA ROSSIYA in Russian 8 Jun 82 p 1

[Article by Yu. Konshin, deputy head of the coal industry sector of the Komi CPSU obkom: "Closed Levels"]

[Text] The people of Vorkuta well remember those days when the best miners, Heroes of Socialist Labor Yu. P. Bronnikov and D. T. Filippov and other leading workers went to Cherepovets when the Vorkuta miners were awarded first place in the competition of subcontractors, then because of the gratitude of the metallurgists for early shipment of the arctic coal. They returned invariably happy and proud of their production collectives. But it was clear even then that the metallurgical plant in Cherepovets was rapidly expanding, the demand for coking fuel was rising, and it was necessary to increase the facilities for its extraction.

The warnings were timely. And they listened to them at the mines. During the last two five-year plans, coal extraction in the Vorkuta faces increased by 40 percent, and the labor productivity rose by the same amount. The new powerful mine "Vorgashorskaya" reached the rated output a year ahead of schedule. But the Vorkuta miners heard more reproaches for shortages of coal in Cherepovets. How correct were they?

Ten years ago, the Cherepovets metallurgists, Murmansk miners and Vorkuta miners, as well as railroad workers concluded a contract for competition on the principle "coal-ore-transport-metal." The metallurgists increased the output of the product in all of these years. However during the 10th Five-Year Plan, an interruption occurred in the work of the miners. In 1981, six mines of the association "Vorkutaugol'" no longer coped with the assignments for extraction of coking fuel.

What occurred at the arctic mines? The specialists know that the Pechora basin has large reserves of coal with excellent properties. To put it plainly, they are not completely used. The miners themselves are responsible for this: there are still considerable idlings of the mine equipment, and at times delays in the preparation of new stoping faces. The labor discipline is not always model everywhere. But there are much more important reasons. However strange, except for the mine "Vorgashorskaya," no construction has been started on any other extracting enterprise in the last 15 years. The situation is exacerbated by the fact that the association "Vorkutaugol'" cannot obtain dozens of units of extremely necessary equipment from its requests.

"We are working on outdated equipment which is worn to the maximum," member of the Vorkuta CPSU gorkom, head of the tunneling brigade of the mine "Severnaya" M. V. Poltorykhin said bitterly at one of the plenums of the oblast party committee. "There are not enough spare parts, which results in breaks and lags. We have switched to a 30-hour work week, but often we even spend our days off in the face. Only we are working with poor equipment and this is useless."

The shortage of mining equipment and working cadres at the mine construction facilities led to the fact that now the active enterprises of the association no longer have prepared levels. It is true that the plans have been prepared for the majority of them, but the realization has been held off for too long. Now eight of the Vorkuta mines have been forced to extract coal in unprepared levels, and at four enterprises, this work is done altogether by local projects. The plan would have to be extended for a victory!

One can sometimes hear talk about the expensiveness of arctic fuel. It is clearly without grounds. The net cost of coal depends not so much on the geographical arrangement of the mines, as on the technical level of production. An example of this is the "Vorgashorskaya" mine. Having equipped it with modern equipment, the ministry obtained one of the reference enterprises of the sector. The net cost of the coal extracted here is half that of the average for the association, and this indicator is almost 2.5-fold better than in the Donbass.

Unfortunately, the example of "Vorgashorskaya" is a single case. Insufficient allocation of capital and equipment by the ministry is "compensated" by the fact that 3 times, in 1977, 1978 and 1980, the association's plan was corrected. The Vorkuta miners do not need indulgences. The miners themselves are interested in seeing that the high quality coal extraction does not drop, but annually rises.

The suggestions made by the association "Vorkutaugol" for re-equipping of a number of mines are awaiting their hour in the USSR Ministry of the Coal Industry. Considerations for further social-economic development of the entire Pechora basin have been sent to the USSR Gosplan. The Vorkuta miners are waiting for an answer. Without additional help, they will not be able to resolve the problem of supplying the Cherepovets metallurgists with the Pechora coking coal. Without construction of new mines, the Vorkuta workers will be the most unreliable partner in the competition of subcontractors. The costs of this situation cannot be underestimated.

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## FUELS

### PODMOSKOVNAYA MINERS EXPLAIN SUCCESS

Moscow PRAVDA in Russian 17 Jun 82 p 1

[Article by N. Makharinets, PRAVDA outside correspondent from Tul'skaya Oblast: "Records of 'Podmoskovnaya'"]

[Text] The miners of the stoping section of Aleksey Ivanovich Titov at the "Podmoskovnaya" mine from the association "Novomoskovskugol'" have extracted over 280,000 T of coal, including 35,000 T above the assignment since the beginning of the year. No one in the basin has successfully produced so much fuel in such a period from the longwall.

The success is viewed here as a remarkable intermediate landmark in the achievement of an important goal.

Having expanded competition for a worthy meeting of the 60th anniversary of formation of the USSR, the section collective adopted increased commitments of producing from the comprehensively mechanized longwall 700,000 T of coal before the end of the year instead of the planned half million tons. This task has been set for the first time under the complicated mining-geological conditions of Podmoskov'ye.

"We have been striving for this limit for several years," says A. Titov. "We gradually emerged to a level of annual extraction of 660,000 T. Each new addition is difficult. Then the influx of water into the longwall intensifies, impairing the movement of the complex, then the sand mass from the above-bed layers of rock threatens to break through. We previously extracted in two paired 'productive longwalls.' It was somewhat easier. With a change in the operating situation, we switched to a single one where the line of the face was smaller. But in it we are not only striving to preserve, but also to surpass the attained labor productivity by accelerating the technological operations and to make better use of the powerful mechanisms."

The giant unit "OKP" stretches along the longwall 120 meters long. Here A. Titov and his comrades are working. The miners at the panels are true masters of their work. They take more from the equipment than stipulated by the planned calculations. They hammer out, load and transport from the face over 2,000 T of fuel per day. This is the average productivity for the basin mine output with numerous personnel, but this section has only 90 people.

The miners have achieved high and stable output because of the scientific organization of labor. The daily preventive maintenance care of the equipment guarantees its lengthy operation without malfunctions. Intrashift idling has been reduced to a minimum. Each member of the collective has mastered related occupations.

The people in the section love to work and are knowledgeable. One involuntarily admires how the brigade foreman of the shift, machinist of the combine and USSR State Prize laureate V. Gorbunov and the machine operators, party group organizer of the section S. Fetisov, N. Kosenkov, and V. Lavrishchev and other right-flank workers of the competition are laboring. Comparing to them, the others improve their occupational skill and multiply their contribution to the common work. On the initiative of the communists, a conservation of different materials and raw materials has been started here. This will reduce the cost of the coal. In the first five months of the year, about R 20,000 have been saved because of the reduction in net cost of fuel.

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## FUELS

### NEEDED IMPROVEMENTS AT URENGOY GAS FIELD SPECIFIED

Moscow PRAVDA in Russian 6 Jun 82 p 3

[Article by V. Lisin and V. Parfenov (Tyumenskaya Oblast): "Pearl of the Tundra"]

[Text] The Urengoy natural-gas field is about 4 years old. But even during this short period it has become first in the country in level of recovery. Each year the national economy obtains hundreds of millions of cubic meters of gas from it. Its flow is increasing continuously. By the end of this five-year plan the country's main field will yield about 40 percent of the whole nation's gas recovery. What is being done today to conquer this unique storehouse with the greatest effectiveness and to keep it flowing liberally as long as possible?

When we speak and think about the riches of the Tyumen' North, there comes into our consciousness a fan of mighty pipelines, which, like the sun's rays, radiate out to the south and southwest from Urengoy. And it is true: without the superlong pipelines, the gas will not reach its millions of consumers and will not light up blast furnaces and fire power-station fireboxes with its bluish flame. But in order to get natural gas to enter the trunk gas pipeline, many wells must be drilled at the field, and fine grids of pipe must stretch from each well to the gathering points. And they, in turn, should feed the collected gas to a common installation for the integrated treatment needed for long-distance transport.

The word "installation" does not give any notion of what this is. He who sees it for the first time is surprised: a real plant! The metal building rests on piles driven into permafrost. Knots of high-capacity pipes and corrugated roofs of buildings gleam among the white snows of winter and the sparse clusters of lichens in the summer, imparting to it an industrialized landscape. Each such semiautomatic plant is capable of receiving gas from the neighboring gathering points, scrubbing it of impurities, and sending 15 billion cubic meters of gas into trunk pipelines each year.

At the Urengoy field, the builders have put two such plants into operation during the first year of this five-year plan. Gas-recovery workers have drilled about 100 wells. A concrete strip is being laid continuously along the field, ever farther to the north, without which it would be simply impossible to move the machinery, drill the wells and conquer new areas. More than 300 million rubles have already been spent on building the Urengoy field's facilities. That is a lot of money, but so is the yield.

By the end of this year Urengoy should produce daily many hundreds of millions of cubic meters of gas. So the builders have to plan to introduce 3 more high capacity installations for integrated gas treatment into operation, lay 200 km of pipe grid within the gas fields, and lay about 300 km of gas-gathering collectors in the tundra. The recovery workers must put another 165 wells into operation. That is a lot of work, but it must be done simultaneously, without allowing even one section to lag.

How can this whole complex of operations be managed more efficiently? From Moscow it would be difficult, and from Tyumen' it would not be easy. Indeed, from Tyumen' to Urengoy is almost the same distance as from Moscow to Tyumen'. It was decided to bring supervision of the construction work closer to the fields--to create at Urengoy a high-capacity main construction administration--one of the subunits of the Ministry of Construction of Oil and Gas Industry Enterprises.

The main administration, under A. Nalivayko, after starting to operate last year, combined the forces of five trusts that were building up the facilities of fields in the Tyumen' North.

Not much time has passed, so it is still difficult to draw conclusions about how effective this decision was. The main administration is experiencing the "development" stage. It has been settling down soundly for a long time, and approaches to the solution of problems are being worked out. It is important that this situation not be prolonged.

PRAVDA has already stated that the builders of the superlong-distance gas routes that have their start at Urengoy are working at a pace that is truly unparalleled in the history of gas-industry development. And how are things going at the Tyumen' North sites themselves, which are called upon to supply gas to a whole fan of pipelines?

Unfortunately, the gas-recovery workers are not meeting the work schedule. Last year they turned over 93 out of 123 wells, and only 61 of them are in steady operation. And here are some more figures. Fifty-two kilometers of gas-field gas-gathering lines have been built within the fields from 16 cluster wells, while the plan calls for 137 kilometers from 33 clusters. Construction of the integrated gas-treatment installations also is lagging: of the 4 planned for last year, only 2 were turned over.

The question arises: thanks to which reserves did the field's workers achieve high growth in gas recovery? One cannot omit from consideration the fact that the Urengoygazdobycha [Urengoy Gas Recovery Association] collective is energetically introducing new equipment and technology. A creative start on the work has been well developed here. Innovators' suggestions have enabled the capacity of each of the existing integrated gas-treatment installations to be increased by 5 billion cubic meters per year above the design. But in order to make up for the lag in introducing new development wells, the productivity of the existing wells had to be increased 1½-fold. And, to put it bluntly, the master control gate of the wells had to be opened wider.

One does not have to be a great specialist to understand that prolonged forcing of the use of a limited number of wells only complicates exploitation of a field. Moreover, it can reduce the period of stable yield of the formations.

"Our Urengoy field, which stretches from north to south for 100 km, is about 30 km wide," says Urengoygazdobycha Association chief geologist P. Geresh. "But because of a shortage of wells we had to withdraw gas only from a corridor 8-12 km wide. It will be difficult later to withdraw the gas that remains in the field's so-called shoulders. This means that it is urgent that wells be drilled and gas withdrawn from them uniformly throughout the whole breadth of the explored area."

Condensate recovery should have started at the Urengoy field last year and then also the crude oil that is deposited in the so-called shoestrings. However, they are not hurrying to do these things in the field's subdivisions. Bureaucratic interests are telling. One of the gas-recovery workers declared frankly: "Our job is to recover gas, let others occupy themselves with the liquid components." Such an approach is scarcely correct.

One cannot bypass this fact: one of the new integrated gas-treatment plants worked for a long time at only half capacity, because the gas-gathering lines were not ready. Also, several wells were idle because of this.

As the gas-recovery workers have correctly confirmed, pipe being laid at the field is small in diameter--one of the chief bottlenecks. One cannot say that Minneftegazstroy did not take measures to solve this problem. However, there is no proper result. Why?

People from the gas field strive to go to the pipeline route, because there one can earn well. And the high pay for laying trunk pipelines is explained simply. Each meter of large-diameter pipe yields more than 700 rubles to the overall "gross" of construction operations. This is the cost of the metal itself. For laying small pipe within the gas fields, which the builders call straw, the amount of funds assimilated is much less, since each meter of thin pipe is one-seventh the price of trunkline pipe, although the labor intensiveness of laying thin pipe is fairly high.

In considering this disparity of profitability of the work, some local economic supervisors consider buildup of the fields a second priority matter. But if this approach is not changed, then expensive trunk gas pipelines will end up with sealed heads. Because of the lag in work at the Urengoy field alone last year, 40 million rubles' worth less of valuable hydrocarbon raw material than planned were received. What is more, operations there are lagging today.

Where is the way out? It was suggested in the well-known decree about improving the economic mechanism. The builders' work must be evaluated not in accordance with the amount of funds expended, not in accordance with the number of rubles and tons of metal consumed, but in accordance with the specific contribution in live labor. Only in this case will collectives be equally motivated to lay pipelines and to build up gas-field facilities. But the new mechanism still has not been introduced, and it is not superfluous to apply authority against those local supervisors who pick out facilities that are profitable for them and to strengthen plan discipline decisively.

Lack of coordination during assimilation of the fields is also fraught with other losses. It would seem that the limitless open spaces of the Tyumen' North would enable a person to be not very much concerned about the consequences of vast transformations of the landscape. But the nature of the tundra--and this is now known widely--is harmed very much. Disturbed sections do not always restore themselves. But in this case we would like to talk not about additional capital investment in

tundra conservation. For indeed one can be concerned about nature also through precise and timely execution of the designs contemplated. And, on the contrary, stretching out the time taken to build up gas-field facilities and incorrect mastery of it not only lead to production losses but also cause harm to nature.

There is especially great harm because of the lack of roads. Last year 1.2 million tons of various kinds of freight were brought to Novyy Urengoy. And these tons still needed to be delivered about the gas fields, but today the roads here come to scarcely more than 80 km, of which only 30 km are hard-topped. The work of the drillers, operators and builders is complicated by the lack of roads. All-terrain vehicles have to flog the tundra lengthwise and crosswise. And the all-terrain vehicles, unfortunately, cannot go twice in the same place--for gullies form along their tracks.

Although the importance of building routes between gas field subdivisions is indisputable, USSR Ministry of Transport Construction still is slow in developing the capacity of its subunits. And it is not accidental that last year, out of 50 km of hard-topped roads, Mintransstroy [Ministry of Transport Construction] laid only 8 km here.

The tundra's soil, which is icy even in the summer here, reacts "sensitively" to heat. Gas from the underground depths carries no little heat. The hot pipes heat up the permafrost and create new swamps. In order to avoid this, the gas must be cooled. This is doubly advantageous: it sharply increases pipeline throughput, since the gas's density increases with cooling. Moreover, the pipe along which the dense, heavier gas goes, "forces" less permafrost out from the ditch.

But the existing installations for cooling the gas still are bulky and ineffective. Each of them consists of 40 multiton units. The operation of such units is complicated, and power consumption is high. It is known that Ministry of Chemical and Petroleum Machinebuilding plants have been called upon to improve as rapidly as possible the equipment for cooling recovered gas.

...Not so long ago the Tyumen' North was called the end of the earth, beyond which was only the ice of the Arctic Sea and the North Pole. That is true, that's how it always was. And only in our day has life brought a considerable revision. Now this is an advanced district of the Soviet people's struggle for a flourishing of the economy. And the center of the advanced region is the pearl of the Yamal tundra--the celebrated and glorious Urengoy gas field.

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## FUELS

### EFFORTS TO BOLSTER OIL RECOVERY AT BALAKHANY FIELD RECITED

Baku VYSHKA in Russian 12 May 82 p 1

[Article by M. Shakhbazov, oil and gas recovery foreman of the NGDU [Oil and Gas Recovery Administration] of Leninneft' [Lenin Oil Production Association]: "At the Balakhany Area"]

[Text] The most capricious wells in the whole Lenin region are at Balakhany. Malfunctions occur mainly because of an abundance of sand that enters from the broken-up rock formations. Therefore, we are building the whole well inventory in a way that will take into account the peculiarities of the sediments and the status of the underground equipment. These two factors are closely interrelated. The loose rocks of the formation lead to premature wear on the bottom-hole deep pumps and pipe and, at times, to serious accidents. As a result, wells are idle and no little fuel is lost. A set of various steps is being taken at the section that are calculated to raise the wells' productivity.

In some wells, for example, we are casing the bottom-hole zone, and in others we are injecting crude oil and kerosene, which improve the collector properties of the rock, and that means an increase in flow of the crude.

Take, for example, well No 1427. There is much confusion about it. Every 8-10 days here a plug accumulates that is so thick that it has to be cleaned with a bailer. An oily blockage was made and liquid was added in the annular space. All this gave good results. Now the well is pumping daily 2-2.5 tons of oil more than usual, while the time between repairs has increased to 3 months.

Our efforts would be to no purpose if the section had not organized precise control over the operation of all 129 wells. The automation that has existed for many years at the fifth subdivision has been of great help to the brigade in this matter.

The operators are showing much creative initiative. At the suggestion of our Holder of Orders of Labor Glory, Second Class, Rafik Mamedov, an optimal itinerary for touring the wells is in operation. This enables the surface equipment and all the service and utility lines to be inspected by the fewest workers and malfunctions that arise to be eliminated in timely fashion.

The brigade pays much attention to selecting pump designs that will, under optimal regimes, provide the wells with maximum productivity. This work, which is being conducted jointly at the section with specialists of the subdivision and of the Leninneft' NGDU, is achieving good results.

Well No 92, for example, had been operating with a bottom-hole pump 32 mm in diameter. In so doing, the valves now and then got clogged up with sand, and the pump had to be changed often. Much money and effort had been spent on repair work. An attempt was made to lower a so-called pipe pump, 44 mm in diameter, into the well. And, also, fluids were poured into it, in the annular space. The calculations proved to be correct. Now the well is working steadily, without interruptions, pumping almost twice as much fuel daily as before. In so doing, the time between repairs has been increased by 1.5-2 months.

For augmented withdrawal of liquid, this year we have begun to use new inserted pumps. The results of the testing of the progressive equipment can be judged by well No 210086, into which a pump 50 mm in diameter was lowered. Its flow rate has tripled.

Specialists from the current-operations group that was created in our administration last year has extended active help to us. Each month they visit the oilfield subdivisions, monitor fulfillment of the planned measures, and give businesslike advice.

The strenuous conscientious labor of the brigade's oilfield workers has been crowned with success. In the results of the All-Union socialist competition for 1981, our collective, just like the brigade of Shirvan foreman Aliyulla Nasirov, initiator of the competition under the slogan, "Maximum yield from each well," won first place among Ministry of Oil Industry brigades for recovering oil and gas.

Right now each oilfield worker is striving to multiply his own labor success. In the first quarter the brigade successfully carried out the plan and the commitments adopted in honor of the 60th anniversary of the forming of the USSR. But the pace of oil recovery can still be increased.

In order to speed up extraction of the remaining fuel from the ground at the old area in the fifth oilfield subdivision, it is planned to drill 10 wells this year. One of them was recently put into operation in our section with a flow rate of 2.5-3 tons of oil. At two other wells penetration has already started, and any day now they also will go into operation.

But this does not relax us. On the contrary, it forces us to work more energetically and thoughtfully at each well. For this is the only way that will bring real success.

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## FUEL

### BETTER METHOD FOR REMOVING DRILL CORES CLAIMED

Alma-Ata KAZAKHSTANSKAYA PRAVDA in Russian 8 May 82 p 3

[Article by K. Isentayev, chief of Regional Planning and the Siting of Productive Forces of Kazakh SSR Gosplan, and Ye. Limanov, head of a faculty of the Kazakh Polytechnical Institute imeni V. I. Lenin, doctor of engineering sciences, and professor: "A Progressive Drilling Method"]

[Text] The country's geological explorers received a good gift during the 10th Five-Year Plan. Designers of Soyuzgeotekhnika [All-Union Production Association for Geological Equipment] of USSR Ministry of Geology developed the KGK-100 complex for drilling holes by a basically new method--with a hydraulic-transport core.

In this case the rock being drilled (the core) is withdrawn continuously from the well along a central channel of a double concentric pipe string by the rising flow of the drilling fluid. This reduces severalfold such labor-intensive and dangerous operations for extracting the core as lifting and lowering the whole string and casing the well. As a result, penetration speed is increased 2-fold to 3-fold and drilling costs are reduced accordingly. Moreover, the quality of the geological information is improved greatly. The reliability of analyses and the precision of identification of the sample with a definite well interval are raised.

To Kazakhstan's geological explorers go great credit for large-scale introduction of the highly effective method of drilling holes with the hydraulic-transport core. The new complex was given the go-ahead by Sevkazgeologiya [North Kazakhstan Geological Association] operating geological organizations. The complex passed tests here in 1974-1975 under operating conditions, during prospecting and exploration for bauxite deposits. The first results confirmed the indisputable advantages of the new drilling method. Industrial production of the KGK-100 complexes, which started in 1977, enabled the Kazakh SSR Ministry of Geology to execute systematic introduction of the new method at all organizations that are prospecting and exploring for solid mineral deposits. The experience that has been gained has enabled the area of use of the complexes to be expanded. More than half the increase in core-drilling speed during the 10th Five-Year Plan was achieved by using the new equipment, and the economic benefit exceeded 1.7 million rubles.

Still more alluring prospects are being opened up for the new method in the future. Even now Sevkazgeologiya is testing new designs for drill pipe, including pipe made of lightweight alloys and a new design for a highly durable rock-breaking tool. Their introduction will enable the spectrum of uses of one of the most effective methods for drilling to be greatly expanded. This will be an important contribution to an acceleration of scientific and technical progress during geological exploration.

Thus, it can be confirmed with confidence that the operation, "Creation of the KGK-100 Complex of Technical Means for Drilling Holes with Hydraulic Transport of the Core and the Organization of Production and Large-Scale Introduction Thereof for Exploration for Solid Minerals," has already found wide practical application in Kazakhstan, West Siberia and a number of other regions, will yield added impetus, will help the explorers of the earth's depths and, in the future, will multiply the country's raw-material reserves. The fact that this work was recently awarded a bonus by the USSR Council of Ministers will serve as new and convincing confirmation of this.

The names of the authors of this work rightfully include Kazakh SSR Deputy Ministry of Geology Ye. M. Selifanov, chief engineer of the North Kazakhstan Geological Production Association B. A. Yedigenov, senior geologist of the Zheleznodorozhnaya Geological Exploration Expedition V. V. Zubritskiy, and driller A. I. Gal'chenko of the Kustanay Geological and Geophysical Expedition of that same association.

The joint work of scientists, designers and highly skilled organizational specialists who have production experience can be an example of the high effectiveness of scientific and technical research and of the rapid introduction of the newest achievements of engineering thought into the national economy, and it will help to solve successfully one of the main tasks set by the 26th CPSU Congress and to intensify prospecting and exploration for minerals.

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## FUELS

### SPECIAL FOOTWEAR, CLOTHING MADE FOR GAS-INDUSTRY WORKERS

Baku VYSHKA in Russian 6 Jun 82 p 2

[Article by TASS correspondent (Moscow): "Footwear Versus the Explosion"]

[Text] Elegant jeans-type cloth, combined with colored chrome leather--that is what this modish summer footwear looks like but it is intended for...gas industry workers of Central Asian regions.

The designers of the men's and women's high boots and low boots--specialists of VNIIGaz [All-Union Scientific-Research Institute for Natural Gas] and the Uzbek republic's House of Patterns--have tried to unite beauty and comfort in an explosion-prone environment, in places where gas is being treated. This is why it is all glued and has a hard rubber sole and a special insole that protects the person's foot against excess heat, even if the ground temperature reaches 60 degrees.

The first models can be seen at the VDNKh SSSR [Exhibition of Achievements of the USSR's Economy], in the Gas Industry Pavilion, where the exhibit, "The Development of an Assortment of Clothing Based upon the Reequipping of the Garment Industry with Machinery," has been opened. A set of special clothing for gas-industry workers who labor in the North is presented here at the exhibition.

Such clothing is capable of protecting a person reliably not only against severe winter cold but also against the enemies of water and snow, as well as gas condensate and methane.

Here before us is a heat-protection suit. There is a jacket with fur collar and detachable lining--incidentally, it also has trousers and a high quilted belt, which protects the waist against the cold. The insulated underwear includes a jacket with knit collar and trousers. The set also calls for a suit with a film coating--for accident situations--which includes a jacket with a hood, trousers with suspenders, and two-fingered mittens with detachable liners.

And an industrial-test lot of coveralls, intended for operators and repair mechanics of gas-industry enterprises, has already been manufactured and tested under operating conditions at enterprises of the Ukraine, Uzbekistan and Tyumenskaya Oblast. One can get acquainted with models of this clothing at the VDNKh SSSR.

This special clothing is to be produced regularly in 1983.

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## FUELS

### BRIEFS

CASPIAN WELL HITS PAY--A new well has been plotted on the geological map of the Caspian Sea. It was drilled ahead of schedule on Bulla Island, 70 km south of Baku. On reaching a depth of 6,196 meters the well revealed a productive horizon of the Bulla offshore field. Now 800,000 cubic meters of gas and 300 tons of crude and gas condensate are being produced here daily. [Text] [Moscow PRAVDA in Russian 23 Jun 82 p 3] Baku, 25 Jun--A strong gusher--300 tons of condensate and 800,000 cubic meters of gas per day--has struck in the Bulla offshore field area, where the well was drilled through to a depth of 6,000 meters. For the first time an eighth horizon of the productive formation was revealed. Specialists confirm that this will create good premises for expanding oil and gas prospecting and exploration in this part of the Caspian. [By PRAVDA correspondent L. Tairov] [Text] [Moscow PRAVDA in Russian 26 Jun 82 p 3] 11409

MANGYSHLAK AHEAD OF SCHEDULE--Alma-Ata, 28 Jun--Since the start of the year Kazakhstan's oilfield workers have sent more than 57,000 tons of "black gold" above the plan to refining. Mangyshlak's oilfield workers are making a meaningful contribution to the labor success. They are maintaining with confidence the daily schedule for extracting raw material from the earth. The annual commitment for above-plan recovery of oil and gas condensate has already been carried out. Collectives of Uzen'neft' [Uzen' Oil Recovery Administration] and Komsomol'skneft' [Komsomol'sk Oil Recovery Administration] are setting the tone for the competition. [By PRAVDA correspondent A. Petrushov] [Text] [Moscow PRAVDA in Russian 29 Jun 82 p 1] 11409

LITHUANIA'S FUEL, POWER PROGRESS--Vilnius, 22 May--An important step in the operations to build the second phase of the Mazheykyay Oil Refinery--installation of the equipment--began here today. The firstling of Lithuania's petrochemicals is an important link in developing Lithuania's fuel and power complex. The republic's power capacity is being boosted at a stepped-up pace. While the output of industrial production during this five-year plan is to increase almost a fourth, the generation of electricity is to more than double. For this purpose, a huge nuclear power station is being erected in the eastern part of Lithuania. The Vilnius TETs-3 will greatly improve the heat and power supply of the republic's capital. [By TASS correspondent V. Zhamaytis] [Text] [Moscow SOTSIALISTICHESKAYA INDUSTRIYA in Russian 23 May 82 p 1] 11409

TYUMEN' ADVANCED EXPLORATION DRILLERS--Novoagansk Settlement, Tyumenskaya Oblast--Having surpassed the drilling schedule almost 2-fold, V. Bukrin's drilling brigade of the Agan expedition of Megionneftegazgeologiya [Megion Oil and Gas Geology Association] has become the leader in the socialist competition among Glavtyumengeology

[Main Administration for Geology in Tyumenskaya Oblast] drillers. Since the start of the year the brigade has put on its account more than 12,000 meters drilled, which is much higher than the plan task and the socialist commitments. The young foreman has been in charge of the Komsomol'sk Youth Collective for only his first year, but he has organized matters with Komsomol fervor. The young leader was helped by the good school of advanced experience which he passed through under his mentor, M. Serezhkin, who last year drilled through more than 40,000 meters, thereby setting a record for deep-well penetration. Working with Serezhkin for several years as assistant foreman, Bukrin learned much from him, and now, having entered into competition with his old comrade, has edged his teacher into second place. But the main drive for victory in the competition to honor the 60th anniversary of the forming of the USSR is still ahead. [Text] [Moscow SOTSIALISTICHESKAYA INDUSTRIYA in Russian 5 Jun 82 p 1] 11409

BETTER ARTEM RECOVERY OPERATIONS--Baku. Engineer Ismail Sadykhov's brigade of Artemneftegaz [Artem Oil and Gas Recovery Administration] has brought the time between well repair to 68 days. This indicator is one of the highest in the Azneft' Association. The oilfield workers are extending the life of the wells and increasing the intake of fuel. The method of thermal stimulation is vindicating itself. The withdrawal of oil at such wells has risen 4-fold and the period between repairs has increased 3-fold. The collective has carried out the commitments adopted in honor of the 60th anniversary of the forming of the USSR. [By D. Melikov] [Text] [Moscow SOTSIALISTICHESKAYA INDUSTRIYA in Russian 12 Jun 82 p 1] 11409

GAS WELL ON KAMCHATKA--A first industrial field of the blue fuel has been found at one of the most remote geographic points of the country. On Kamchatka, the Kshuuskaya well has yielded a gasser more than 50 meters high. Chief geologist of the Kamchatka Oil and Gas Exploration Expedition S. Z. Sayfutdinov reports: "According to preliminary studies, the Kshuuskaya is already producing from 250,000 to 1 million cubic meters of gas per day. The natural output of oil was established for the first time on Kamchatka in 1921. At that time oil and gas formations were observed in other places. Today we are working from Tigil' to Galygin. This is several hundred kilometers of almost impassable tundra. Improved equipment is needed for successful fulfillment of a strenuous program. We, unfortunately, have at our disposal equipment that is not new and often long outmoded. The Kshuuskoye gas field, according to specialists' calculations, will in the next few years release the area from importing a substantial amount of expensive fuel. Methane, which was observed in the Kshuuskoye area, can be transported by gas pipeline also about the whole Sobolevskiy and Ust'-Bol'sheretskiy Rayons without the use of repumping stations." [By A. Klimenko] [Text] [Moscow SOVETSKAYA ROSSIYA in Russian 7 May 82 p 1] 11409

LENINOGORSK PRODUCES GASLIFT EQUIPMENT--Kazan'--The Leninogorsk plant for producing automation equipment has yielded its first output. These are special devices for regulating the pressure and consumption of gas. They are intended for recovering oil by the more economical and promising gaslift method. Receiving the regulators from Tataria are oilfield workers of West Siberia, where this method will be used to extract many millions of tons of "black gold" from the formations. Oilfield workers of Mangyshlak, the North Caucasus and other oil-bearing regions will also receive the innovation. The Leninogorsk plant will become the USSR Ministry of Oil Industry's leading enterprise for providing the whole industry with the automated mechanization. The equipment will be used not only in recovery but also in drilling wells, in the current repair and overhaul of wells, and in the geophysical

study of formations. The young enterprise is being built from structure, materials and equipment delivered in complete units from the Hungarian People's Republic. [By A. Sabirov] [Text] [Moscow IZVESTIYA in Russian 13 Jun 82 p 1] 11409

TAZOVSKIY PORT NEARLY READY--The construction of a 300-meter deepwater channel was completed in the icy tundra of the Tazovskiy Peninsula yesterday. It joins the Ob' Bay with a new gas field--the Yamburg. This will enable the northerners to unload high-tonnage ships not in the open sea but at shore docks. Yamburg is the first gas giant whose operations are being started far beyond the Arctic Circle. A large group of builders has already landed there. But the main assault will begin with opening of the navigation season. The main cargo will be delivered over the Northern Sea Route. However, now nature has arranged a severe test for the pioneers, having blocked the ships' path to the shore with an enormous river-mouth bar. [By TASS] [Text] [Moscow SOTSIALISTICHESKAYA INDUSTRIYA in Russian 13 May 82 p 1] 11409

VYBORG'S OFFSHORE DRILLING PLATFORMS--...It is 908 meters long, more than 60 meters wide, and about 100 meters high. These are the internal dimensions of the "Shel'f" installation which the Vyborg Shipbuilding Yard has undertaken to build. It must be said that the erection of such designs is for the Vyborgers a comparatively new matter. For until recently unitized-cargo carriers and container ships, which are well known to sailors for their excellent quality and reliability, have come off the building slips of this enterprise until recently. And now here are the "Shel'fs," semisubmerged floating structures, which geological explorers are waiting for impatiently. These installations will enable the sea bottom to be drilled at a depth of 200 meters, while the well's depth can reach 6 km. The photos [not reproduced] show senior builder of the design V. Markushin and Komsomol ship assembler V. Andryunin on the building slip; and the assembly of one of the frameworks of "Shel'f-4"--the first installation in the Vyborgers' series. [Text] [Moscow SOTSIALISTICHESKAYA INDUSTRIYA in Russian 8 Jul 82 p 1] 11409

NORTHERN OILFIELDS RIVER SUPPORT--The RSFSR Minrechflot [Ministry of the River Fleet] comments on the article, "School of Management." The policy of creating amalgamated transshipment complexes in the regions where new oil and gas fields are being assimilated has been adopted. The RSFSR Ministry of River Fleet, after examining the article (No 45 (46)), consider that it posed correctly the question of the need to establish joint transshipment complexes in regions where oil and gas fields are being conquered. At present, river transport is hauling to the oil and gas bearing regions of West Siberia, including hauling for the Yamburg gas field, with transshipment of cargo at the settlement of Urengoy. In order to provide for river transport to haul the ever-increasing amounts of cargo directly to the area of the fields and to the mouth of the Nyudya-Mongotoyepoka River, an approach channel and stationary mechanized docks must be built. With a view to speeding up work on construction of the Yamburg gas-field facilities, Mingazprom [Ministry of Gas Industry] and Minneftegazstroy [Ministry of Construction of Petroleum and Gas Industry Enterprises] undertook to build a temporary approach channel and a dock for organizing the acceptance and offloading of cargo from river ships. Minrechflot has examined, jointly with Mingazprom, questions of the accelerated development of design and budget-estimating documentation for construction of the approach channel and fixed mechanized docks. In order to support haulage of the cargo that is necessary to the fields being developed in the Ob'-Tazovskiy Bay area, Minrechflot is calling for the delivery to the Irtysh Shipping Line during the 11th Five-Year Plan of a transport fleet, including cargo motorships with a load capacity of 2,100 tons each, refrigerator ships, container carriers, tankers, dry-cargo barges and tugs." [Text] [Moscow IZVESTIYA in Russian 6 Jun 82 p 1] 11409



PIPELINE COMPRESSOR STATION FARMING--Ukhta--Tens of high-powered compressor stations support the flow of the Siyaniye Severa gas stream. They operate on the same high-calorie gas that they are pumping, giving off, in so doing, a large amount of heat. Basically, it is at present being discharged uselessly into the atmosphere. But soon it will be used differently. For each compressor station will be capable of heating, even during the most severe cold, up to 3 hectares of greenhouses. Almost 40 special free-heat recovery boilers have been erected at the stations. And at Ukhta, construction of the greenhouse combine is going on full blast. Here there will be 10 greenhouses, a vegetable storage and a laboratory building with a control panel. At the start of next year this combine will produce the first green onions, and later cucumbers and tomatoes will be ready. This is the first phase, but the gas-field workers are planning to expand their greenhouse activity at Ukhta to 9 hectares, and they want to build a cow barn and a piggery for 400 and 200 head, respectively, close to the hothouse complex. A greenhouse unit is also being built near the Kindorskaya compressor station. A design for the erection of a large greenhouse combine that will operate on waste heat at another industrial complex of the European North--Mikuni--has been approved. [By P. Novokshonov] [Text] [Moscow IZVESTIYA in Russian 23 Jun 82 p 3] 11409

SHEBELINKA GAS WORKER ACHIEVEMENTS--Khar'kov--The collective of the Shebelinka Gas Field Administration, in competing for a worthy greeting to the 60th anniversary of the founding of the USSR, has recovered more than 200 million cubic meters of fuel raw material above the plan. The shifts of foremen N. Serokurov and S. Vlasyuk labored especially well. The advanced workers are persistently improving the technology for the recovery and treatment of gas and for the overhaul and underground repair of the wells. [By A. Vyatkin] [Text] [Moscow SOTSIALISTICHESKAYA INDUSTRIYA in Russian 18 Jun 82 p 1] 11409

BAYKAL-AMUR MAINLINE GEOLOGY--Khabarovsk--The Fevral'skoye building-materials deposit is the first mark plotted by geological explorers during this field season on the geological map of the Eastern Section of the BAM [Baykal-Amur Mainline]. The mainline's zone has become the main proving ground for Far Eastern geologists. An area of 4,500 square kilometers will be studied in detail here. [Text] [Moscow SEL'SKAYA ZHIZN' in Russian 14 May 82 p 1] 11409

BEST BASHKIRIA DRILLING BRIGADE--Ufa--Good news about the labor successes of the earth's penetrators often arrive from the remote Burayeva oil-bearing area, where foreman I. Seregin's brigade, the best in Bashkiria, is now drilling holes. The advanced collective has already outstripped the schedule by 4,000 meters of penetration since the start of the year. The achievement, frankly speaking, is a record. The more so since the geological conditions here are very complicated. The drillers are working with precision and a good rhythm. Driller R. Yasaviyev, his assistant A. Pengitov and mechanic A. Ibayev are carrying out all the operations in coordinated fashion and skillfully. The brigade practically does not know what idle time is. Productive time here is 98 percent--a fact that speaks for itself. And here is the result: during the first half of the year they went through more than 16,000 meters of rock. It is a direct duty of the oilfield workers to produce more raw material from which fuel will be produced, including also fuel for the needs of the countryside. And for this purpose, primarily recovery capacity must be created. It is this task that the members of the advanced brigade have set for themselves. The oilfield workers are also taking a highly responsible attitude toward recultivation of the land that is occupied by the wells, pipelines and other structures. The collective of the Krasnokholmskiye Drilling Administration, where

I. Seregin's brigade works, is doing everything possible to assure that restoration work will be carried out after construction of the recovery capacity is completed. Each year the administration turns over to kolkhozes and sovkhozes up to 100 hectares of restored land on which grain can be raised again. [By I. Payvin] [Text] [Moscow SOTSIALISTICHESKAYA INDUSTRIYA in Russian 8 Jul 82 p 1] 11409

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## PIPELINES

UDC 621.643.002(204.1)

### PROGRESS, PROBLEMS IN BUILDING UNDERWATER PIPELINE CROSSINGS DISCUSSED

Moscow STROITEL'STVO TRUBOPROVODOV in Russian No 6, Jun 82 pp 7-8

[Article by V. N. Gerasimov of Soyuzpodvodtruboprovodstroy [All-Union Association for the Construction of Underwater Pipelines]: "Underwater Workers Are on a Labor Drive"]

[Text] During the quarter of a century of its existence, the collective of underwater construction workers laid 3,000 underwater crossings totaling 2,300 km in length on the country's most important transport arteries. The Central Asia-Central Economic Region, Bukhara-Urals and Soyuz gas pipelines, the multistrand Nadym-Punga-Nizhnyaya Tura gas-pipeline system, the Druzhba, Shaim-Tyumen' and Surgut-Polotsk oil pipelines, the Tol'yatti-Grigor'yevskiy Liman ammonia pipeline and other lines were erected with their active participation. Unique underwater crossings were erected across large rivers, such as the Volga, Dunay, Ob', Yenisey and Amur, and offshore pipelines were built in the Caspian Sea and in the Gulf of Finland and the Gulf of Sivash.

Today the underwater pipeline builders face new, greater and more complicated tasks.

The rising pace and scale of construction of trunk pipelines have required new, progressive organizational and technical solutions for laying underwater crossings. It has become necessary to restructure the whole management structure in the area of underwater engineering operations and to transfer these operations to a qualitatively new level.

The All-Union Construction and Installing Association Soyuzpodvodtruboprovodstroy was established in the second half of 1981, based upon Soyuzpodvodgazstroy [All-Union Underwater Gas Pipeline Construction Trust]. There are two new trusts within the association--Vostokpodvodtruboprovodstroy [Trust for the Underwater Construction of Pipelines in the Eastern Economic Region] at Ufa and Surgutpodvodtruboprovodstroy [Surgut Underwater Pipeline Construction Trust], two specialized underwater-engineering operations administrations and an experimental plant in Leningrad Oblast.

During the 11th Five-Year Plan the association is to do 580 million rubles' worth of construction and installing work, 300 million rubles' worth of it in West Siberia. Work volume will double that of the 10th Five-Year Plan.

At least 1,400 inverted siphons totaling 622 km in length are to be built and 173 million m<sup>3</sup> of soil are to be excavated, including 82 million m<sup>3</sup> of underwater ditches, in order to carry out this program successfully.

Construction of underwater crossings is going on full blast on the main trunk gas pipelines. The main operations on underwater crossings for the Urengoy-Gryazovets-MOK [Moscow District Gas Ring] gas pipeline were completed in April 1981. During construction of the Urengoy-Petrovsk gas pipeline, 16 crossings were erected over large water obstacles and 20 inverted siphons were laid.

Work is going on simultaneously in 1982 on three gas arterials that are based on 1,420-mm diameter pipe.

During erection of the Sever-Central Economic Region gas-pipeline system at least three underwater pipelines must be laid for each river.

An increase in the pace of underwater-engineering operations at centrally monitored pipeline construction projects is helping in no small way to solve the combined construction of five gas arteries in one corridor.

Thus, over a period of several years, from 10 to 12 strands are to be laid successively on a single route. This solution has for the first time enabled the association to organize flowline-type construction of underwater pipelines, which enables rhythmic work and continuity of production processes. In all, 25 integrated work sections are to be created, of which 13 are already working on reserve strands of the Urengoy-Petrovsk and the main strands of the Urengoy-Novoposkov pipelines.

The association has developed, jointly with VNIIST [All-Union Scientific-Research Institute for Trunk Pipeline Construction] and NIPIorgneftegazstroy [Scientific-Research Institute for the Organization of Construction of Oil and Gas Industry Enterprises], schedules for the work of the integrated sections for the successive erection of all underwater crossings of the gas-pipeline system at a pace of 3 km per year. Brigades specialized in welding pipe into lengths, in insulating the welded lengths, and in ballasting are established in each operating section.

The schedule calls for a full and uniform workload on all line workers in accordance with their skills. Thus a brigade of welders, on completing work on one strand, transfers quickly to another, presenting a work front for the cleaning and insulation of welded pipelengths. The sections are outfitted with a full set of special construction equipment. Each equipment operator is assigned a machine or mechanism, to increase the responsibility of the worker for the preservation of the equipment entrusted to him.

An agreement about the creation of standing operating repair brigades to service the base sections has been concluded with Soyuzremonttruboprovodtekhnika [All-Union Association for the Repair and Overhaul of Pipeline Construction Equipment]. Thus, the equipment's utilization effectiveness and its service life are being raised sharply.

Housing towns with good living conditions and domestic amenities are being built for each work section. Long-term contracts for the organization of eating and for servicing dining halls and stores are being concluded with ORS's [workers' supply sections]. These measures will enable favorable conditions to be created for forming stable production collectives and for reducing personnel turnover considerably.

Underwater construction workers are readying themselves with a special feeling of responsibility for work on the Urengoy-Uzhgorod gas-pipeline route. The

association's subunits are to lay 68 inverted siphons, build 31 underwater crossings and lay 68 underwater strands of pipeline totaling 38 km in length. For the first time, all the underwater pipelines will be made of pipe 1,220 and 1,420 mm in diameter. Total earthmoving work will be more than 11 million m<sup>3</sup>, including more than 8 million m<sup>3</sup> of underwater soil.

An important national-economic task of the 11th Five-Year Plan is the accelerated assimilation of the Astrakhan gas-condensate field--one of the largest raw-materials bases for the chemical and petrochemical industries. Two gas pipelines 1,020 mm in diameter and three condensate pipelines made of 530 mm pipe are to be laid where this field's pipelines cross the Volga-Akhtyubinsk floodplain.

A further speedup of scientific and technical progress in the modern era is the chief means for raising labor productivity, the basis for successful fulfillment of the 11th Five-Year Plan.

Jointly with VNIIST and State Inspectorate for Construction Quality of Minneftegazstroy [Ministry of Construction of Petroleum and Gas Industry Enterprises], the association has developed and is introducing a "Set of Integrated Measures for Improving the Technology and for Raising the Pace and Quality of Construction of Underwater Crossings During 1982-1985."

This set of measures is aimed at erecting underwater crossings prior to construction of the linear portion. Underwater crossings on the Sever-Central Economic Region gas-pipelines system comprise about 50 percent of the association's whole program for the 11th Five-Year Plan. The remaining underwater crossings (on product pipelines, oil pipelines and drainage lines) are to be erected in various parts of the country. One of the main deficiencies in organizing construction on these routes is the protracted redeploying of machinery, equipment and mobile housing from job to job. In many cases the redeployment costs equal the costs of erecting the crossings or they exceed them. On navigable rivers redeployment is accomplished expeditiously. Redeployment while working on the large number of small and medium-size rivers, as well as closed bodies of water, is executed with the use of automotive and rail transport, taking two to three times as long as the construction process itself. In order to cut time losses on redeployments, the association is working to create transport columns that are supplied with special load-lifting and transporting equipment for the movement of heavy machinery and equipment.

The association contemplates a number of measures for industrializing construction and for reducing the influence of seasonality on the underwater-crossing construction process.

In the Volga-Kama basin, the method of preparing equipped, welded pipeline lengths at bases, to be delivered later afloat to the crossing site, has proved itself well. This method will be used during construction of the gas-pipeline systems in the Ob'-Irtysh basin and on the Volga, in the Astrakhan area.

The hydraulic-fill method of erecting jobsites will enable seasonality to be excluded during welding and erecting operations and the laying of underwater pipelines. Where there are incessant rains and flooding, it produces a great economic benefit and is the basic measure that enables round-the-clock construction to be conducted.

The most labor-intensive operation when building crossings is the excavation of underwater ditches. In 1982, as much soil will be excavated during the erection of underwater crossings as during the construction of 1,100 km of the linear portion of a 1,420 mm diameter pipeline. The short navigation seasons, the spring high water, spring and fall ice drifting, and restrictions placed on the dates of and methods for executing underwater earthmoving work that are instituted by Minvodkhoz [Ministry of Land Reclamation and Water Resources] and Minrybkhhoz [Ministry of Fishing Industry] organs increase labor intensiveness in erecting the crossings still more.

In order to support the prescribed pace of construction, the association is doing constant, daily work on the effective use of support and service craft and special equipment.

In winter, underwater ditches are excavated by DGS-150 suction dredges, water jets and pneumatic soil pumps. Round-the-clock work of suction dredges has been organization.

The construction of underwater crossings for pipe 1,420 mm in diameter will enable the number of reserve strands of the line to be reduced, metal to be saved, the amounts of earthmoving work to be reduced, scraper traps for acceptance and startup to be dispensed with (their cost in some cases exceeds the cost of the crossing), and the gas pipeline's operating qualities to be improved.

Crossings for 1,420 mm diameter pipe will be erected on the Urengoy-Novopskov, Urengoy-Uzhgorod and Urengoy-Yelets gas pipelines. This will enable construction periods to be shortened and will yield an economic benefit totaling 14 million rubles. All this will require the solution of many technical questions. The large weight and great rigidity of the 1,420 mm diameter pipe, with ballast, change the construction technology greatly. VNIIST and the Gazstroy Mashina SKB [Special Design Bureau] are working, jointly with the association, on the creation of the industrial technology and a set of machines and mechanisms for building underwater crossings for 1,420 mm diameter pipe.

For underwater crossings of less than 1,220 mm diameter across navigable rivers, it is desirable to use various pipes that have been concreted at the factory and delivered to the laying site by water transport. This precludes the necessity for carrying out directly at the erection site such operations as cleaning, insulating, lining and ballasting of the pipeline. The construction site is transformed into a site for assembling pipeline made of finished members, opening up a great potential for increasing the work pace. When erecting underwater pipelines 1,220-1,420 mm in diameter at crossings over small rivers and enclosed water bodies, self-fastening ballast can be installed after laying or while the pipeline is being pulled, which greatly facilitates pipeline laying. The construction of underwater crossings is desirable for crossing streams with high, stable shores.

The creation of a set of equipment for directional drilling will enable a qualitative change in the whole process of erecting crossings over water barriers with soft soils where the water surface is less than 500-1,000 meters wide. The time and cost for building underwater pipelines can be reduced severalfold by excluding all types of underwater engineering operations. The influence of production processes on the ecological status of the natural environment is reduced.

Improvement of ways for organizing labor plays an important role in raising performance effectiveness. The brigade contract should be further developed. Measures for introducing the expeditionary rotating-duty method for constructing pipelines should be promoted.

Having mounted a labor drive in honor of the 60th anniversary of the forming of the USSR, the collectives of Soyuzpodvodtruboprovodstroy production subunits have promoted socialist competition for a worthy greeting to this portentous date and for fulfillment and overfulfillment of the 1982 plan and of the five-year plan as a whole.

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## PIPELINES

UDC 621.613.002.2+658.5

### CURRENT PLANNING, CONTROL OF PIPELINE ERECTION SHOULD IMPROVE

Moscow STROITEL'STVO TRUBOPROVODOV in Russian No 6, Jun 82 pp 8-9

[Article by V. A. Tolstolugov of GIVTs [Main Computing and Data Processing Center]: "Improved Systems for Current-Operations Planning and Management of Gas Pipeline Construction"]

[Text] In resolving the tasks of improving management during oil and gas construction work, special attention should be paid to the main elements of the construction assembly line, namely the primary production collectives that perform the whole complex of operations during pipeline construction.

Production collectives with various forms of organization and work specialization and by different levels of concentration of resources in the flowline operations groups worked on construction of the Urengoy-Gryazovets-MOK [Moscow District Gas Ring] and the Urengoy-Petrovsk gas pipelines last year. An analysis has indicated that the greatest productivity was achieved in the subunits of trusts that did work on the line in integrated fashion and were oriented toward the final result and not toward an intermediate result. Such collectives include the integrated operating flowline groups of Soyuzgazspetsstroy [All-Union Trust for the Construction of Special Gas-Industry Facilities], Kuybyshevtruboprovodstroy [Kuybyshev Pipeline Construction Trust], Mosgazprovodstroy [Moscow Gas Pipeline Construction Trust], Vostoknefteprovodstroy [Trust for the Construction of Oil Pipelines in the Eastern Economic Region], Priob'truboprovodstroy [Ob' Region Pipeline Construction Trust] and Soyuzintergazstroy Association.

Thanks to rational work organization, a high level of vocational training, a combining of trades, the consolidation of specialized welding, earthmoving and insulating-and pipelaying columns, the maintenance of an equipment reserve, a continuous supply of materials and equipment, the timely repair and supplying of complete sets of equipment, and other effective operational and organizational solutions, high production results were achieved and the introduction of pipelines ahead of schedule was provided for.

However, not all collectives managed to achieve high productivity. Work was organized poorly at Ryazan'truboprovodstroy [Ryazan' Pipeline Construction Trust], which was working on construction of the Urengoy-Gryazovets-MOK gas pipeline. The basic causes of the trust's poor work were inadequate concentration of resources, low production discipline and poorly effective management.



During erection of the Urengoy-Petrovsk gas pipeline Nefteprovodmontazh [Oil Pipeline Construction Trust], Urengoytruboprovodstroy [Urengoy Pipeline Construction Trust], Omsknefteprovodstroy [Omsk Oil Pipeline Construction Trust] and subunits of Glavukr neftegazstroy [Main Administration for the Construction of Oil and Gas Industry Enterprises in the Ukraine] proved to be among those lagging. In striving to carry out large amounts of work on the line itself, these collectives did not pay enough attention to bringing pipe, curve inserts and reinforced-concrete weights to the line and to the engineering preparation for construction. This led to unjustifiable idle time of mechanized columns after completion of work on the line. During the concluding stage of construction of the Urengoy-Petrovsk gas pipeline, the work pace to eliminate operational interruptions was inadequate, and this, in the final analysis, was reflected negatively in the dates for turnover of the facility as a whole.

The trend toward establishing high-capacity production collectives that are specialized by stage of construction operations has been defined with precision.

The search for more improved organizational forms should and will be continued, but, in order to raise construction work effectiveness, the existing mechanisms for current operations planning and management within operational flowline groups must be reviewed. Scientifically substantiated standardizing documents that cover all questions of rational technology and methods for current-operations planning and management have not been developed within the industry yet in adequate amounts. The various elements of current-operations planning are used in construction management practice only when making up the weekly and daily schedules. Current-operations management in some cases is based not upon a current-operations plan that has been economically substantiated and balanced with the resources, but only upon the manager's intuition. All this leads to the appearance of an irregular work pace in construction work, losses of time and funds because of noncoordination of the work of the primary production collectives of the general contracting and subcontracting organizations, interruptions in the supplying of materials and equipment, and, in the final analysis, a lessening of construction quality.

Current-operations management has been poorly organized at the production-section and construction-administration levels. Because of a lack of skilled controllers, the effectiveness of decisions adopted at a higher level is reduced. This forces organization supervisors to assume the duties of coordinators to the detriment of other important management questions. A lack of order in organization and operations leads to disorder in information. Often there are cases where some supervisors consciously distort information about the work results of the subunits under them. Thus, false information about the production situation that exists in the section arrives at superior levels. Yet decisions will be adopted on the basis of this information, and the price for doing so can be very high.

The content of the information that arrives at all levels of management is not orderly. On the one hand, it does not describe in adequate detail the production situation that exists, and, on the other, it includes an excess of indicators, which overload the information content.

The inadequacy of radio communications equipment within the construction section leads to information being delivered with the use for these purposes of duty vehicles, welded-pipelength carriers and other equipment, sharply reducing management responsiveness, increasing the idle time of mechanized columns because of

organizational and technical factors, and, in the final analysis, leading to irretrievable time losses because of late adoption of management decisions.

Management also is production, but of a qualitatively new commodity--information and management decisions. Management has its specific forms for organizing management work, its special equipment and its technology for gathering and processing information and of generating management decisions. The final results of production activity depend upon the quality and rationality of operational and organizational decisions in the sphere of management.

The appearance of a problem-type management situation at a facility requires rapid reaction of the control organs and engenders a demand for a management decision. The time that a problem exists is a net time of irretrievable losses of effectiveness of the system as a whole. Reducing such losses to a minimum is one of the basic tasks of the current-operations management system. The difference between the actual  $T_{y\phi}$  and the standard  $T_{yH}$  duration of the system's control cycle can be defined as the time of undermanagement

$$\Delta t = T_{y\phi} - T_{yH}.$$

The management system should operate in a way that will fulfill the condition:

$$\begin{cases} \Delta t \rightarrow 0, \\ T_c \rightarrow \min, \end{cases}$$

where  $\Delta t$  is the time of undermanagement and  $T_c$  is the time of the existence of the problem-type management situation.

It is impossible to eliminate losses in the system completely, but they can be reduced to a minimum by eliminating losses from undermanagement and by raising the quality of the management decisions adopted in specific production situations. Management decisions should provide for achievement of the best results at least expenditure in labor, supplies and equipment, and fuel-and-power and financial resources. In order to cope with the problem that has been posed, the supervisor of an organization and his staff should master modern methods of analysis and quantitative evaluation of the production situations that arise, forecasting, current-operations planning, and the adoption of rational management decisions, and they should understand accurately the potential and necessity for applying means of communication and computer technology.

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## PIPELINES

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### IMPROVED PIPELINE-WELDING METHODS DESCRIBED

Moscow STROITEL'STVO TRUBOPROVODOV in Russian No 6, Jun 82 pp 15-17

[Article by I. K. Pokhodnya, V. Ya. Dubovetskiy, V. N. Shlepakov, L. N. Orlov and A. N. Kutovoy of the Institute of Electrical Welding imeni Ye. O. Paton and A. G. Mazel' and M. Z. Sheynkin of VNIIST [All-Union Scientific-Research Institute for the Construction of Trunk Pipelines]: "Resource-Saving Technology for Welding Pipelines"]

[Text] The nonrotary joining of trunk pipelines is now performed basically by manual arc welding. The deficiencies of this operating process are low productivity, lengthy training of welders of high skills, and the requirement for special electrodes, the cost and labor intensiveness for the manufacture of which are high.

The amount of welding operations in pipeline construction is constantly increasing. Execution of the program of operations now contemplated is hampered by a shortage of highly skilled overhead welders.

The elimination of the above-mentioned shortages and an essential increase in productivity through the positive forming of the joint is achieved by welding with a self-protecting flux-cored electrode.\* This method and the welding equipment were developed by the Institute of Electrical Welding imeni Ye. O. Paton in collaboration with VNIIST and the Kiev branch of Gazstroy Mashina SKB.

A scheme of the welding process with positive joint forming was cited in the work, "Avtomaticheskaya svarka nepovorotnykh stykov trub bol'shogo diametra samoza-shchitnoy poroshkovoy provolokoy" [Automatic Welding of Nonrotary Large-Diameter Pipe Joints with a Self-Protective Flux-Cored Electrode] (B. Ye. Paton, I. K. Pokhodnya, V. Ya. Dubovetskiy et al--STROITEL'STVO TRUBOPROVODOV, 1981, No 2). The scheme is characterized by the presence of a melting space formed by the rims of the pipes and by the surface of the preceding layer and the shaping device.

The flux-cored electrode is fed into the melting space and the electric arc burns between its end and the liquid bath. The pipes' rims are fused through the heat of the arc and the welding bath. The slag that is formed during melting of the wire protects the metal of the wire bath that is crystallizing from tack-welding to the shaping device. As the joint crystallizes, the shaping device is shifted about the perimeter of the joint, along with the automatic welding mechanism, from the bottom up.

\*I. K. Pokhodnya, A. M. Suptel' and V. N. Shlepakov. "Svarka poroshkovoy provoloka" [Flux-Core Welding]. Kiev, Naukova dumka, 1972.

Two heads simultaneously weld the right and left semiperimeters of the joints of the large diameter pipe.

During welding by the first head, the metal fusing element from the electrode wire is, as a rule, used as the bottom of the melting space (figure 1a). The bottom of the melting space can also be a thick well-made tackweld. Welding by the second head starts from the point previously welded by the first head (figure 1b), and it is cleaned off carefully by a grinder.

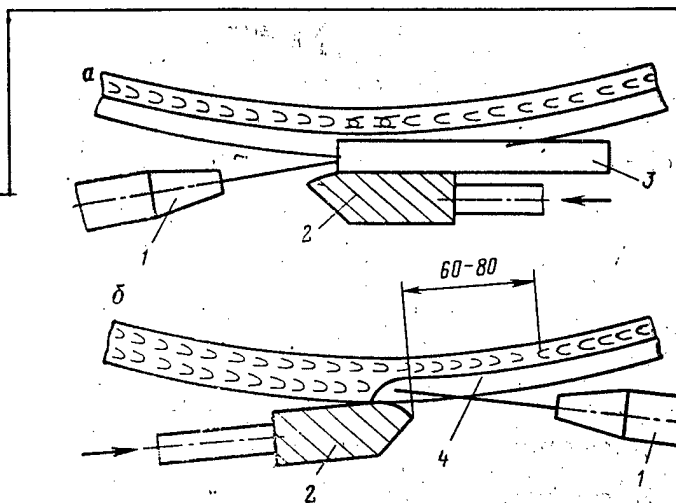
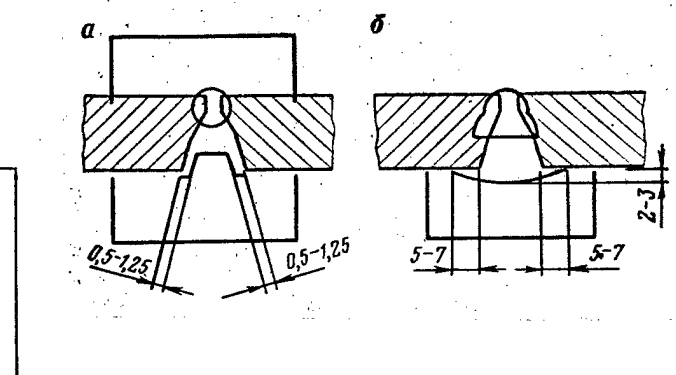


Figure 1. Diagram of Start of the Welding Process.

- a. The right semiperimeter.
- б. The left semiperimeter.
- 1. The welding head.
- 2. The water-cooled shoe.
- 3. The metal fusing element.
- 4. The area of start of the welding by the second automatic equipment.

Figure 2. Profile of the Forming Shoe.

- a. For welding the filling layer.
- б. For welding the facing layer.



A catch is made in the upper part of the pipe, converting the process, by means of an angle corrector, from a positive to a semipositive process. On finishing the welding by the first head, the thickness of the joint is gradually decreased by increasing the welding speed. The second head finishes where the preceding joint is located.

During the welding of the fixed-position joints of the pipes, the position of the welding bath changes in space. While the welding can be carried out without special complications on the vertical section of the joint, the shaping of the joint in the overhead and the lower positions is made difficult by the spreading of the bath's metal about the shaping devices.

Spilling of the bath is prevented, using the gas-dynamic pressure of the arc, which is determined by the current strength and by the diameter of the wire and its angle of inclination.

Moreover, in the lower and overhead positions, a weld penetration of the pipe rims that is unequal in height can occur. In the overhead position the rims that are adjacent to the internal surface of the pipe are melted more intensively, while in the lower position, this is true of the rims that are adjacent to the outer

surface of the pipe. In order to eliminate this nonuniformity, during welding the electrode wire is shifted according to the height of the welding space, from the outer surface of the pipe at the start of the process and to the inner surface at the end of it.

The technology of automatic fluxed-core welding for a manual backing run of the weld root on pipes 1,220 and 1,420 mm in diameter, with standard beveling of the rim, is now being used in Minneftegazstroy organizations, particularly in Glavyuzh-truboprovdstroy [Main Administration for Pipeline Construction in the Southern Economic Region]. The same as with indirect welding under a flux on PAU-type pipewelding installations, welding of the main portion of the throat area, where labor intensiveness is great, is automated. Simultaneously, work is being done to improve the equipment for shaping the joint on the inner surface of the pipe and the technology of automatic welding of the root layer.

Automatic welding is carried out with DC of reverse polarity with a flux wire of 2.3 mm diameter with an extension of 40-45 mm, at the regimes cited in table 1.

Table 1. Automatic Welding Regimes for Nonrotary Joints with Positive Shaping of the Joint with a Manual Backing Run

Layer	Potential on the arc, V	Welding current A	Average weld- ing speed, m/hr
First filling layer.....	25-28	260-320	12-14
Second filling layer.....	25-28	260-400	10-20
Facing layer.....	26-32	260-450	10-20

Depending upon the pipe's wall thickness, 10-14 mm, 15-22 mm or 22-25 mm, welding is done, respectively, in 1, 2 or 3 layers. Where the width of the beveling is more than 14 mm, the electrode wire transmits the lateral fluctuations with a swing of 4-5 mm less than the width of the beveling, and with a frequency of 0.5-2 Hz, depending upon the welding speed. The thickness of each layer is regulated by changing the height of the tooth of the shaping shoe that enters the bevel (figure 2a). The shape of the convexity is determined by the dimensions of the groove on the guide shoe for welding the facing layer (figure 2b). The guide shoe's groove for welding the facing layer should be 10-15 mm wider than the bevel.

Each welding head is outfitted with a set of the necessary guide shoes. The design of the shoes allows them to be replaced in 15-20 seconds. The shoes are joined to the welding head by a cantilever-lever system which provides for pressing the shoe to the pipe with a force of 400-450 N.

Aside from the movement of cooling water around the pipe or the cooling water with antifreeze of the shaping shoe, the welding head provides for carrying out all other functions customary for arc welding: feeding of the welding wire, current supply, adjustment of the amount of extension, and correction of the electrode's position. Unlike other welding methods, the wire in the case described is fed into the melting space tangentially to the pipe's surface, and, when necessary, at an angle. Even the system for controlling the welding head is different. The necessity for adjusting the arc's position according to the height of the melting space is provided by the possibility for stopping the welding head without cutting off the wire feed and the burning of the arc, and also by increasing the speed of

Table 2. Indicators for Operation with the Use of  
Manual Welding of Nonrotary Joints and of  
Automatic Welding with Styk Complexes

Welding	Pipe dia- meter (mm)	No of welders per head element	Number of			Produc- tivity (joints per shift)	Output per		Labor intensive- ness of welding one joint (man-days)
			Workers per brigade	Weld- ers	Oper- ators	Mech- anisms	Welder or operator, joints per shift	Worker (km per yr)	
Manual	1,220	4	22	10	--	9	3.0	8	0.73
		7	34	17	--	12	2.4	6.9	0.85
	1,420	4	29	14	--	11	1.6	4.4	1.32
		8	41	24	--	15	1.4	4.25	1.37
Styk complex	1,220	4	19	4	4	8	3.8	9.2	0.63
		7	24	7	4	9	3.6	9.3	0.63
	1,420	4	21	4	4	8	2.8	6.1	0.96
		8	29	8	6	9	2.3	6.45	0.91

movement. In the first case the arc and the welding bath are raised to the leading edge of the shoe and in the second case it is lowered into the bottom of the melting space. The devices controlled by these functions are mounted on a lever on the operator's control panel.

In order to weld nonrotary joints of 1,220- and 1,420-mm diameter pipelines, the OKTB [Branch Engineering and Design-Development Bureau] of the Institute of Electrical Welding imeni Ye. O. Paton and the Kiev branch of the Gazstroy Mashina SKB developed the Styk set of equipment.

Each welding apparatus of the Styk complex is outfitted with two welding heads, which are mounted on a hinged rail of the hinged-clamshell type. The system for installing the rail on the pipe and the locking thereof have been converted to hydraulic operation.

The rail track has been suspended on the load boom of the self-propelled welding unit, which is mounted on the base of a TT-4 crawler tractor. The power unit, which consists of a three-phase AC source of 100 kw, three welding rectifiers, a place for cooling the shaping shoes and a cabinet for controlling the welding heads, have been mounted in the cab of the feed unit.

For auxiliary operations a nonself-propelled mobile workshop has been developed, in the closed cab of which equipment for preparation for welding has been placed: a heating oven for hardening electrode wire and a machine for winding it into the cassette, a drill, and a mechanic's bench. For moving along the pipeline route, the workshop is attached to one of the feed units.

The Styk complex is produced in modifications that differ chiefly in the number of welding units. The variant to be used is selected as a function of the diameter and thickness of the pipe walls, the method for organizing the work, the locality's relief, and other factors.

The forms used for organizing the work are based upon the widely disseminated technology for the assembly of pipe joints and the welding of the root joint, and the "hot pass" with electrodes with an organic coating. The number of joints readied for later welding, which is prescribed by the program, is conditioned by the number of welders in the head element. This, in turn, determines the number of welders who will weld filling and facing layers synchronously with the head element. The replacement of welders on the filling and facing layers is accomplished from the estimate that one power unit of the feed unit of the Styk complex that is served by two operators releases four or five welders (table 2). This replacement enables synchronism of the work with the head element.

It is evident from table 2 that for 1,220-mm diameter pipe the replacement of 10 welders by the Styk complex with four operators will enable 40 joints to be welded per shift, with a reduction of about 25 percent in manning of the brigade and the number of mechanisms. For pipe 1,420 mm in diameter, the replacement of 16 welders by the Styk complex with 6 operators enables manpower of the brigade and the number of mechanisms to be cut by about 35 percent. Labor expenditure per joint is reduced 15-50 percent.

In comparison with welding in protective gases and with resistance welding, which provide a high pace of erection of pipelines, fluxed-arc welding possesses great

mobility. It is easily "inserted" into any organization of operations, permits the welding of angles of rotation, valve unit joints, short pipelines of surface structures, and pipelines in swampy sections.

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## PIPELINES

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### CAST-SLAG WEIGHTS FOR UNDERWATER PIPELINES TESTED

Moscow STROITEL'STVO TRUBOPROVODOV in Russian No 6, Jun 82 pp 17-18

[Article by V. V. Ivashchenko and P. P. Basharat'yan of Soyuzpodvodtruboprovodstroy [All-Union Trust for Underwater Pipeline Construction], Moscow, and I. Ya. Chernyavskiy and V. A. Bykov (UralNIIstromproyekt [Urals Scientific-Research Institute for Building Materials Design]), Chelyabinsk: "New Weights for Underwater Oil and Gas Pipelines"]

[Text] A large amount of reinforced concrete and cast iron are now being consumed in manufacturing weights that are used when pipelines are laid across rivers and flooded lands. In order to reduce materials consumption, Chelyabinsk's UralNIIproyekt proposed the manufacture of underwater-pipeline weights that are made out of metallurgical slag, which is a production waste.

Jointly with Soyuzpodvodtruboprovodstroy, the institute worked out a technology for casting heavy weights. Their design is similar to that of the reinforced-concrete weights that are being used, comprising two semirings that are coupled to the lined pipeline with bolts.

A test lot of weights (7 sets) for 1,020 mm pipeline were cast at the Chusov Reinforced-Concrete Structure Combine's casting yard. This location was chosen because of the possibility of obtaining molten slag from pig-iron pouring that possesses good casting and mechanical properties. The slag's strength under compression was 175-250 MPa, and its bulk density was 3-3.2 tons/m<sup>3</sup>.

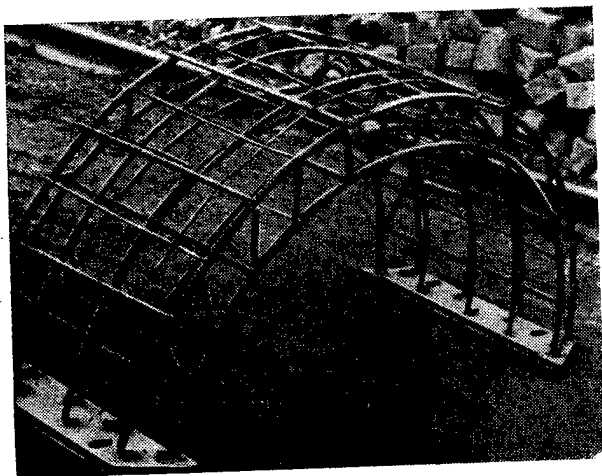
In order to increase the mechanical strength of the weights, the design called for a welded framework made of steel reinforcement (figure 1). The reinforcement was welded to two steel plates which bear the tensile loads when the weight halves are coupled with bolts.

Two variants of casting molds were developed for the pouring--with horizontal and with vertical parting planes. Stiffening ribs were specified, to prevent buckling.

The weights were poured by the pit method.

The finished items are shown in figure 2.

The mold with the vertical parting proved to be more feasible industrially. Moreover it enables simultaneous manufacture of two semirings (that is, a full set of weights), not one as when a mold with horizontal parting is poured.



1. Сварной каркас из стали

Figure 1. Welded Steel Framework.



2. Готовые утяжелители

Figure 2. Finished Weights.

The weights were tested in accordance with a Soyuzpodvodtrubprovodstroy program, in two steps. The first step--a monitoring inspection, measurements, weighing, and check of mechanical strength for loading and unloading--were carried out at the reinforced-concrete structure combine. The second step--assembly of the weights and dragging the ballasted section of the pipeline over an uneven rocky surface for a distance of more than 600 meters--was carried out at the SUPTR-6 section of Soyuzpodvodtrubprovodstroy.

The tests indicated the possibility for manufacturing weights--both for underwater crossings and for pipelines laid in swamps, river floodplains and other flooded places--from metallurgical slag.

According to preliminary economic estimates by UralNIIstromproyekt, when production of the poured-slag weights by a department is organized under operating conditions their cost will be lower than that of the manufacture of reinforced-concrete weights. For example, the estimated cost of manufacturing 1 ton of pig-iron ballast is about 200 rubles, reinforced-concrete ballast 50 rubles and poured cast-slag ballast 25 rubles.

In the case of full replacement of pig-iron ballast and of cast-iron ballast by cast-slag weights, the economic benefit in 1982 would be 14.5 million rubles. This is almost 1.5-fold all the capital investment necessary for organizing industrial production of the weights.

The Chusov area, through which main gas pipelines of the 11th and 12th Five-Year Plans will pass, is more favorable for organizing large-scale production of the cast-slag weights. Centralization of their manufacture, unification of design, and reduction of material expenditures can be provided for here.

The full requirement for slag for ballast is 120,000-130,000 tons in 1982 and 150,000-160,000 tons in 1985.

In mechanical strength, the reinforced-slag castings cede nothing to cast-iron and they greatly surpass reinforced-concrete products. This circumstance and the high resistance of metallurgical slag to chemicals and abrasion paves the way for new, wide opportunities for their use in the national economy. For example, slag can be manufactured for ship ballast, counterweights for load-lifting machines, gravel, and slab for beach reinforcement. The melted slag can be applied to the inner surface of steel pipe intended for transporting aggressive or highly abrasive products (for example, soil slurry).

It is quite important, also, that the development of cast-slag production will help to clean up lands now occupied by voluminous slag heaps, which increase environmental pollution.

It is planned to continue in 1982-1984 to improve the technology of pouring products made of metallurgical slag with a view to creating weights for pipelines of all diameters and new designs for weights, including those that attach themselves to the pipeline. The technology for casting slag with a bulk density of 4-5 tons/m<sup>3</sup> will be developed. The aims of the work will correspond completely to the program for further acceleration of scientific and technical progress, which includes the execution of measures for the economical use of material resources, the integrated treatment of raw materials, using low-waste technology, and the creation and introduction of basically new materials into production.

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## PIPELINES

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### METHOD FOR IMPROVING TRANSPORT FOR PIPELINE CONSTRUCTION DESCRIBED

Moscow STROITEL'STVO TRUBOPROVODOV in Russian No 6, Jun 82 pp 27-28

[Article by R. M. Shakirov and A. A. Veremeyenko of Glavvostoktruboprovodstroy  
[Main Administration for Pipeline Construction in the Eastern Economic Region], Ufa:  
"The Forecasting of Time Losses During Transport Operations"]

[Text] Methodological documents that will permit the effectiveness of automotive transport support of trunk pipeline construction to be evaluated do not exist at present. A methodology is needed that will enable not only the requirement for motor vehicles to be determined but also more rational methods to be found for managing road-transport support, taking into account the natural and climatic conditions of the region of construction, the presence of roads, the remoteness of the facilities from administrative control centers, the quality of the roadbed and of road designs, the level of preparation for repair and servicing subunits, drivers' qualifications, and so on.

In order to develop practical solutions, regressive-correlation analysis methods are used that permit the influence of the enumerated factors to be considered and forecast evaluations of losses to be obtained in order to estimate the requirement for motor vehicles for the period of construction being planned. The following factors are examined:  $x_1$  is the method for hauling pipe elements (it is varied at the levels: 1--through haulage; 2--multiple-step with one transshipment; and 3--multiple step, with two transshipments; and so on);  $x_2$  is the average daily air temperature in the area of construction, degrees C;  $x_3$  is total precipitation, mm;  $x_4$  is average operational (actual) traveling speed of welded-pipelength carriers, km/hr (determined in accordance with five control runs);  $x_5$  is the total number of intricate road sections that influence the traveling speed of the welded pipelength carriers;  $x_6$  is the average utilization factor of the vehicle pool;  $x_7$  is the average length of a freight haul, km;  $x_8$  is the average daily traffic intensity, vehicles per day (varied at the levels: 1--0 to 50; 2--50 to 100; 3--100 to 150; and so on);  $x_9$  is the average daily number of welded-pipelength carriers engaged in hauling pipe elements to the line;  $x_{10}$  is the number of sections sent out;  $x_{11}$  is the nominal diameter of the pipeline, mm (varied at the levels: 1--1,200; and 2--1,400);  $x_{12}$  is the number of drops of sections per welded-pipelength carrier;  $x_{13}$  is the total number of traffic jams;  $x_{14}$  is the average time taken to eliminate one traffic jam;  $x_{15}$  is the average number of vehicles in one traffic jam;  $x_{16}$  is the 8-hour loss of time by one welded-pipelength carrier as a consequence of drop of a section;  $x_{17}$  is the average traveling speed between stops (without hindrance) of a welded-pipelength carrier (determined in accordance with three control runs);

$x_{18}$  is the average estimated traveling speed over a first-category winter automotive road or an improved dirt road;  $x_{19}$  is the average percent of vehicles that work in two shifts; and  $x_{20}$  is an evaluation of the preparation of the automotive base for the operations. The levels of variation are shown in the table.

Levels of Variation

Evaluation of the automotive base's readiness for operation	Readiness of vehicles for operation, percent	State of supply of spare parts and reserve components and assemblies, percent	Repair services for reduction of $T_{\text{тн}}$	Current operational services for reduction of $T_{\text{ен}}$
Unsatisfactory	<30	<30	None	None
Satisfactory	30-60	30-60	Inadequate	Inadequate
Good	>60	>60	Existent	Existent

The following were considered as modeling indicators:  $t_{\text{сн}}(x_{22})$  are time losses caused by reduction of vehicle speed because of deterioration of the roadbed's operating characteristics;  $t_{\text{нн}}(x_{23})$  are time losses connected with the drop of sections;  $t_{\text{кн}}(x_{24})$  are constructive losses that arise during traffic jams and stops at crossings over natural and manmade obstacles, the absence of facilities built for turning onto the line, and also time losses because of traffic jams and stops on the open road. For an example of construction of a model, data were used that were obtained during the construction of three lines of the Punga-Vuktyl-Ukhta gas pipeline. The parameters of  $x_1$ - $x_{20}$  varied at 39 levels.

During the first stage of the research a correlational matrix was constructed. The correlation was computed by means of a CORRE program from a battery of applied programs. During the examination, relationships that depended upon the value of a paired coefficient of correlation that was less than the critical  $r_{\text{кн}} = 0.55$  were discarded. This value corresponds to a validity of conclusion of 0.95 and to 29 degrees of freedom.\*

Then the factor criteria that have a value greater than 0.8 of a paired correlation coefficient were found. The presence in the regression equations of two criteria with such a relationship leads to a distortion of results, and that means that it does not permit the function to be used in practice. Therefore, it is necessary to exclude from further consideration those criteria that have the least physical significance.

After examination of the correlation matrix, regression functions were obtained:

$$\begin{aligned} x_{22} &= x_{22}(x_4, x_5, x_6, x_7, x_9, x_{13}, x_{14}, x_{17}, x_{19}); \\ x_{23} &= x_{23}(x_{23}, x_{12}, x_{13}, x_{14}, x_{17}, x_8, x_5); \\ x_{24} &= x_{24}(x_{17}, x_{14}, x_6, x_{11}, x_3). \end{aligned}$$

In order to construct regression correlations, an STPRG subprogram was used that enabled a set of functions to be obtained for various numbers of parameters and any power of the variables. The precision of the approximation was evaluated by the

\*I. G. Venetskiy and V. N. Venetskaya. "Osnovnyye matematiko-statisticheskiye ponyati i formuly v ekonomicheskoy analize" [Basic Concepts of Mathematical Statistics and Formulas in Economic Analysis]. Moscow, Statistika, 1974.

mean square deviation  $\sigma$ . For practical research, second-power polynomials were obtained:

$$x_{22} = 65,72 + 0,001399x_5^2 - 36,544987x_6^2 - 4,620663x_{17} - 0,096411x_5, \quad \sigma = 5,82\%, \quad (1)$$

$$x_{23} = 3,87 + 0,343912x_{13} + 0,065598x_{14} + 0,238014x_8^2 - 1,637496x_6, \quad \sigma = 1,23\%, \quad (2)$$

$$x_{34} = -16,1 + 1,212425x_{14} - 1,622253x_{11} - 0,071765x_{17}^2 + 3,466017x_{17} - 30,335541x_6, \quad \sigma = 2,51\%, \quad (3)$$

Let us analyze the regression functions. From the expression (1) it follows that the more significant parameters that influence  $x_{22}$ , that is,  $t_{c\eta}$ , are  $x_5$ ,  $x_6$  and  $x_{17}$ .

The presence in the equation of a second-power member indicates that there is a certain limit (the numerically determined value  $x_5 = 30-35$ ) up to which the prescribed operating effectiveness of automotive transport can be preserved when road-repair services are effective. If the number of complicated road sections exceeds 35, the time losses  $T_{c\eta}$  rise sharply. An analysis of the correlation matrix also enables the extremely essential feedback  $r_{6x_5} = 35$  between  $x_6$  and  $x_5$  to be found. This indicates that improvement of the roadbed helps to preserve automotive transport and facilitates the maintenance of an adequately high vehicle-pool utilization factor. With improvement of roadbed quality,  $x_{17}$  rises, and, as a result, the value  $t_{c\eta}$  is reduced. The correlation (2) enables the conclusion to be drawn that it is more desirable to study  $x_{23}$  losses, that is  $t_{\eta\eta}$  losses, as a function of  $x_2$ ,  $x_{13}$  and  $x_{14}$ .

By studying expression (2) at the extreme value for  $x_8$ , we find that the preferred traffic intensiveness for second category roads is 100-150 vehicles per day. With an increase of  $x_8$ , losses  $t_{\eta\eta}$  rise. Losses from  $x_{13}$  and  $x_{14}$  that have the direct statistical relation  $r_{13,14} = 0.36$  exert a great influence on  $t_{\eta\eta}$ , and this means that a reduction in the number of traffic jams simultaneously reduces the time for eliminating them. The quality of the roadbed exerts a determining influence on  $x_{13}$  and  $x_{14}$ , which follows from the numerical values  $r_{14,5} = 0.71$  and  $r_{13,5} = 0.35$ .

Four parameters enter into expression (3), it being a quadratic term. A study at the extreme value enables the conclusion to be drawn that losses  $t_{k\eta}$  will be least if roadbed quality enables an average speed between stops to be at least 25 km/hr. With increase in pipeline diameter, the vehicle pool's utilization coefficient is reduced because of the difficult conditions for automotive transport operation. At the same time, an increase in  $x_6$  leads to higher traffic intensity, which is associated with an increase in  $t_{k\eta}$ . If roadbed quality is improved, the influence of traffic intensity on  $t_{k\eta}$  is reduced.

The functions that are obtained on the basis of the statistical material, which depict the progress of road transport support during construction of three lines of the Punga-Vuktyl-Ukhta gas pipeline, enables the main transport time losses to be determined, their share in total losses to be evaluated, and measures to be worked out for reducing them, both during construction and after completion of the work when preparing organizational measures for new jobs.

The proposed models are stable and enable losses during transport operations to be forecast not only for winter-type roads but also for dirt roads.

An analysis of the models enables still another important conclusion to be drawn: road quality proves to be a determining influence for all types of time losses. Thus, a rise in the role of road transport support will create rhythmicity of the work of the basic flowline groups that work on the line, and this, in the final analysis, will help to reduce trunk pipeline construction time.

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KILNED KERAMZIT SAND BETTER THAN QUARTZ SAND AS AN AGGREGATE

Moscow STROITEL'STVO TRUBOPROVODOV in Russian No 6, Jun 82 p 39

[Article: "Speed up the Output of a New Building Material"]

[Text] The problem of the manufacture at the Al'met'yevsk combine of keramzit sand for lightweight-concrete structural articles was discussed at a meeting of the Section for Building Materials, Constructional Structure and the Construction Industry of the Scientific and Technical Council of Minneftegazstroy [Ministry of Construction of Petroleum and Gas Industry Enterprises].

A set of research and experimental-test operations for creating the technology for obtaining keramzit sand of fine fractions by roasting in a swirl-flow kiln was conducted by Tatneftepromstroymaterialy [Tatar Trust for Building Materials for Erection of Oil Industry Enterprises], jointly with NIIkeramzit [State Scientific-Research Institute for Keramzit] of USSR Minpromstroymaterialov [Ministry of Construction Materials Industry]. The bulk density of the new material is 15-20 percent lower than that of sand obtained by crushing keramzit. Use of the new material instead of quartz sand as fine aggregate during the manufacture of keramzit-concrete outer-wall panels for housing and for industrial construction reduces the weight of the articles and increases the heat-physics properties of the lightweight concrete. In turn, this leads to a reduction of the weight of buildings and structures and a reduction of heat losses therein.

The Al'met'yevsk combine, jointly with NIIkeramzit, created an industrial technology for obtaining keramzit sand based principally on a new design for a swirl-flow kiln.

As a result of introducing this technology, the cost of the heat energy for producing the final product was reduced 1.5-fold to 2-fold; the necessity for crushing the keramzit gravel (the source material) is precluded; the quality of the keramzit sand is raised; and the potential for using production waste from keramzit gravel as a source material appears.

The section approved the work done to create equipment and technology for producing high-quality roasted keramzit sand at the Al'met'yevsk combine.

The measures that provide for the construction and introduction into operation of an experimental installation at the Al'met'yevsk combine in the contemplated period that were presented by Tatneftestroy [Tatar Trust for the Construction of Oil Industry Enterprises] were recommended for approval.



Glavneftegazsnabkomplekt [Main Administration for Supplying and Outfitting Oil and Gas Industry Enterprises] should finish the complete outfitting of the industrial equipment in accordance with Tatneftepromstroyaterialy's specifications.

The Al'met'yevsk combine, with the involvement of NIIkeramzit, should refine the calculation of the expected economic benefit from introducing the swirl kiln and should develop provisional specifications for the new material.

NIIkeramzit must develop recommendations for creating a swirl kiln with a productivity of 25,000-30,000 m<sub>3</sub> per year, including a look at the possibility for using secondary heat for roasting the keramzit.

VNIIST [All-Union Scientific-Research Institute for the Construction of Trunk Pipelines] and the EKB [Experimental Design Bureau] for Reinforced Concrete, enlisting the aid of NIIkeramzit, must develop an integrated program for studying the raw materials base of Minneftegazstroy enterprises, for developing and improving the technology for producing lightweight aggregates, and for creating effective outer-wall structure on that basis.

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## PIPELINES

UDC 621.643+622/647.7

### HYDRAULIC IRON-ORE CONCENTRATE PIPELINE BEING DEVELOPED

Moscow STROITEL'STVO TRUBOPROVODOV in Russian No 6, Jun 82 p 39

[Article: "A System for Hydraulic Pipeline Transport of Iron-Ore Concentrate"]

[Text] The results of the development of one of the systems for the hydraulic pipeline transport of iron-ore concentrate were discussed at a meeting of the Section on New Continuous and Special Types of Transport. The route is 220 km long, pipeline diameter is 426 mm, and wall thickness is 14 mm at high-pressure sections and 11 mm at low-pressure sections. Concentration of the slurry at nominal productivity is 57 percent (by weight), at maximum productivity--60 percent.

Repumping of the slurry is provided for by three pump stations. GNPA 400/100 slurry units were chosen as repumping units.

The operating parameters were defined by means of calculations in accordance with computer programs and were confirmed by the results of experiments at pipe installations.

Two variants of construction of the hydraulic transport system were examined: with a return waterline for replacement of the water picked up with the concentrate, and without a return waterline.

A comparison of the calculated technical and economic indicators for a railroad and for a concentrate pipeline indicated the desirability of constructing the latter. In this case the annual economic benefit for the variants without the return water line and with the return water line were, respectively, 11.24 and 10.23 million rubles.

The section approved the results of development of the hydraulic pipeline transport system for delivering iron-ore concentrate.

It was recommended that VNIIPitransprogress [All-Union Scientific-Research and Design Institute for Progressive Types of Transport] develop the technological requirements for modernization of the low-head centrifugal pumps, in order to increase their reliability.

It was recommended that when the design for testing the hydraulic transport installation is developed, the possibility of testing on it the specialized equipment that is being developed for it (a tank with devices for mixing the slurry, the fixtures, the pump units, and so on) be called for.

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## PIPELINES

### BOOK ON PIPELINE DEFECTOSCOPY FOR CONSTRUCTION FOREMEN REVIEWED

Moscow STROITEL'STVO TRUBOPROVODOV in Russian No 6, Jun 82 p 47

[Review by S. N. Antonov of the book, "Kontrol' kachestva svarnykh soyedineniy truboprovodov dlya nefiti i gaza" [Monitoring the Quality of Welded Oil and Gas Pipeline Joints] by R. R. Khakim'yanov, M. Kh. Khusanov, I. Ye. Neyfel'd et al, Moscow, Nedra, 1981]

[Text] The interest of specialists has given rise to publication of the book, "Kontrol' kachestva svarnykh soyedineniy truboprovodov dlya nefiti i gaza," by R. R. Khakim'yanov, M. Kh. Khusanov, I. Ye. Neyfel'd, et al (Moscow, Nedra, 1981), in the "Reliability and Quality" series, whose publication is being shared by other publishing houses. This work is dedicated to comprehensive coverage of the practice of nondestructive defectoscopy and the testing of pipelines. The book is intended for constructor-foremen of pipelines, and it was written in understandable fashion and at a high technical level.

In the book's beginning section the authors set forth the basic demands on the quality of welded joints, analyzing some of the factors that cause defects to appear in welded joints. In indicating that the reliability of welded joints is determined to a great extent by their stressed state, the authors examine the distribution of residual welding stresses in the edge welds of the pipeline, and they disclose the main directions for solving the problem of the influence of technological defects on the joint's load-carrying capabilities.

An analysis is made of modern methods for monitoring welded joint quality. Special attention is paid to nondestructive monitoring methods--radiographic, magnetographic and ultrasonic. This part of the book concludes with information about effective ways for organizing quality-monitoring operations.

A separate chapter is dedicated to a detailed analysis of welded pipeline quality by penetrating radiation. Sources of ionizing radiation, its nature, and methods of recording it are examined. In describing monitoring with the recording of joint-weld images on X-ray film, the authors give practical recommendations on choice of optimal variants of photographic materials and exposures, focal length and so on. The factors that influence the quality of the image of the article being monitored and schemes for radiation exposure are cited. The characteristics of X-ray film, methods of using it, and types of fluorescing screens and areas of their use are given.

Special attention is paid to stages and regimes for irradiation--to the preparation of the welded joints, the loading of cassettes, and choice of regimes and parameters. Nomograms for determining exposure times for various methods of irradiation and recommendations on X-ray film development are cited. Peculiarities in the use of X-ray equipment are indicated.

In transferring to descriptions of gamma-ray defectoscopes that are used in transillumination of welded joints, the authors note the simplicity of their use, which is extremely important under the difficult conditions of the pipeline routes. Of interest to the reader are the specifications of gamma-ray defectoscopes, data about the initial activity of the radiation sources, optimal timing of the sequence of operations, information about possible defects of radiographic photographs, and so on.

Types and specifications of magnetic tapes, the structure of the magnetic field, schemes for recording the field of a defect on magnetic tape, and so on are disclosed in detail. The most important operations of magnetographic monitoring--the magnetizing of the welded joints and the recording of the field of scattering from the defects onto the magnetic tape--are examined. The characteristics of magnetizing devices and formulas for computing the magnetizing force required for providing magnetic induction that will technically saturate the magnetized zone of the welded joint of the prescribed wall thickness are cited.

In describing magnetographic defectoscopes (with pulsed, brightness and universal indications), the authors examine in detail their layout and operation and cite the basic trends in further design improvement.

Data about the methodology for deciphering signals from the defects and evaluation of the quality of the welded joints in accordance with the results of the monitoring are most useful from the practical point of view. The necessary information about tuning defectoscopes in accordance with calibrating tapes, the technique of reading magnetic recordings of joint welds, duplication of magnetographic monitoring results, and the compilation of conclusions on the monitoring results are shown here.

In the chapter that is dedicated to describing ultrasonic monitoring, the authors tell about its physical bases, principles of the radiation, and the reception of ultrasonic oscillations.

The basic parameters of the echo-pulse method of monitoring and data about standard calibrating models are examined. The functional scheme of modern defectoscopes, the principles of their operation, and their basic components and specifications are cited. The basic principles of ultrasonic defectoscopy are of practical interest. Optimal methods for studying a joint weld and schemes for moving the scanner, and methods for determining the characteristics of defects that have been found are proposed. In moving directly to the methodology and technology of the ultrasonic monitoring of welded joints, the authors disclose in sequence questions of the preparation and evaluation of the quality of welded joints and give practical recommendations on the defects that are discovered.

The principal difference between the book reviewed and other publications on the same topic is that this one has a part on cleaning the pipeline cavity and testing

pipelines, without which a system of measures for monitoring welded-joint quality cannot be considered complete.

The peculiarities and advantages of various testing methods are analyzed: hydraulic, pneumatic and hydropneumatic. In examining the parameters of tests, the authors point to the necessity for strict observance of the requirements of the appropriate standardizing documents, they cite nomograms for computing the test pressure, and they give recommendations on organizing the work of cleaning the cavity and of testing.

The book has generalized well the problems linked with monitoring the quality of welded pipelines that are designed for transporting oil and gas. At the same time, a number of annoying inaccuracies that are encountered in this work must be noted. Data on an obsolete model of the MDU-1 defectoscope that was developed about 20 years ago are cited. In chapter 6, table 27 refers to the obsolete SNIIP [Construction Norms and Regulations] III-D 10-72, which has been replaced by SNIIP III-42-80.

However, the inaccuracies enumerated do not affect the overall positive evaluation of the book by R. R. Khakim'yanov, M. Kh. Khusanov and I. Ye. Neyfel'd and others, "Kontrol' kachestva svarnykh soyedineniye truboprovodov dlya nefti i gaza." It will be of great practical help to trunk pipeline builders.

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